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Synoptical Tables for determining N. A. Insects.

Orthoptera.

- 1 (8) Head sometimes vertical, sometimes nearly horizontal. Hind femora resembling those of the other legs, and scarcely, if at all, stouter or longer than the middle pair. [Non-saltatorial.]
- 2 (3) Head subhorizontal, mouth anterior; tarsi 3-jointed or less; anal area of wings extending around the apex over more than half the front border of the wing; abdomen terminated by forcipate appendages *Forficulariæ*.
- 3 (2) Head and mouth variable; tarsi 5-jointed¹; anal area of wings never infringing on the front border; abdominal appendages not forcipate.
 - 4 (5) Body oval, depressed; head nearly horizontal and wholly or almost wholly withdrawn beneath the pronotum; mouth parts posterior; ocelli generally two in number; antennæ long, setaceous; pronotum shield-like *Blattariæ*.
 - 5 (4) Body elongate, generally narrow: even when depressed or expanded, generally but little broader than deep at the posterior extremity of the prothorax; head free, often separated from prothorax by a deep constriction.
 - 6 (7) Head oblique, trigonal; mouth inferior, and more or less posterior; antennæ seldom so long as the body, slender, setaceous²; ocelli three; pronotum longer than any other segment; fore legs raptorial, terminating in a single claw, which with the tarsi is placed beneath the spinous tibia when at rest; anal cerci articulated *Mantidæ*.
 - 7 (6) Head subhorizontal, generally quadrate or gibbous; mouth anterior and inferior; antennæ generally longer than the body, setaceous, moderately stout; ocelli three, but often wanting; pronotum very short; fore legs constructed like the others, the fore femora often arcuate at the base; anal cerci inarticulate *Phasmida*.

¹ Occasionally a joint is absent, probably by an accidental loss of the leg in early life: since in the reproduction of lost limbs—a phenomenon not unusual in the lower Orthoptera—one tarsal joint always disappears.

² Pectinate in some males.

- 8 (1) Head vertical, the mouth parts below; hind femora very much stouter or very much longer (or both) than the middle femora. [Saltatorial.]
- 9 (10) Antennæ much shorter than the body, filiform, clubbed or ensiform, but if the first, scarcely tapering; the joints distinct, often depressed; ocelli three in number; tarsi 3-jointed, similar in structure on all the legs; base of the male tegmina with no tympanum on dorsal surface; ovipositor composed of a double pair of short arcuate plates, vertically divergent at tip *Acrydii*.
- 10 (9) Antennæ much longer than the body, setaceous, delicately tapering; ovipositor usually prolonged into a compressed blade or needle.
- 11 (12) Ocelli generally wanting; tarsi (at least of middle legs¹) 4-jointed, nearly similar in structure on all the legs (but see note); fore-coxæ usually broader than long; middle field of tegmina, like the costal field, nearly or quite vertical when closed; base of ♂ tegmina (when present) furnished on dorsal surface with a tympanum,² limited to the anal area, and crossed by a prominent nervure formed by the last axillary vein; ovipositor (when exerted) forming a strongly compressed, generally ensiform blade, the inner valves almost always partially exposed the entire length of the ovipositor, the tip not expanded. *Locustariae*.
- 12 (11) Ocelli sometimes present, sometimes absent; tarsi 3-jointed,³ those of either the fore legs, or else of the hind legs, differing from the others in structure; fore coxæ longer than broad; middle field of tegmina, like the anal field, nearly or quite horizontal when closed⁴; base of ♂ tegmina (when present) furnished on the dorsal surface with a tympanum extending across the anal and median areas, crossed by a prominent nervure formed by the anal vein; ovipositor (when exerted) forming a nearly cylindrical, straight or occasionally upcurved needle, the inner valves generally scarcely exposed, except at the expanded tip . . . *Gryllides*.

For general descriptive and methodical orthopterological works, treating among others of N. American insects, the student may consult Burmeister's *Handbuch der Entomologie*, Vol. II, part II, Gymnognatha, 8vo, 1838 (descriptions mostly in Latin); Serville's *Orthoptères*, 8vo, 1839 (French); Saussure's *Mélanges Orthoptérologiques*, fasc. i-iv. 4to, 1863-72, including

¹ In *Daihinia* the fore and hind tarsi are 3-jointed.

² There are exceptions to this in exotic genera.

³ Stål is inclined to place in the *Gryllides* the *Stenopelmata* and *Gryllaerididae*, which have 4-jointed tarsi, but coxæ longer than broad; I have, however, left them, as has usually been done, in the *Locustariae*.

⁴ The Asiatic *Schizodaetylus* is a curious example of a *Locustarian*, with an enormously developed anal (horizontal) field, giving it the aspect of a *Gryllidan*. Many Orthopterists consider it as such.

thus far only Blattariae, Mantides and Phasmida, published separately and also in Mém. Soc. Phys. et d'Hist. Nat. Genève; the same writer's Histoire Nat. du Mexique, etc., 4^e mém., 1864-5 (Blattariae); 3^e mém., 1871 (Mantides); and further his contributions to the French Government's Mission Scientifique au Mexique (see Bibl. Rec., No. 380), which has so far included the Blattariae, Mantides, Phasmida and Gryllides (all these works are richly illustrated, and are in French, with Latin diagnoses). Stål's Recensio Orthopterorum, I-III, 1873-75 (Latin) has so far covered the Phasmida, Acrydii and Locustariae. Walker's List of Dermaptera in the British Museum, 6 vols., 8vo, 1868-71 (English and Latin), covers the Blattariae and the saltatorial families; it is a work thoroughly bad in classification and description, and is infinitely more a hindrance than a help; as a bibliographical aid it has its merits, and it describes about 140 N. American species as new. Glover's Illustrations of N. American Entomology, Orthoptera, 4to, 1872, gives thirteen crowded plates, not executed in the best manner, with names. Emmons, N. York Insects, 4to, 1854, figures a few species. See also Harris's classic work on Injurious Insects, 3d ed., in which the New England species known to him are described, and some of them figured; my paper in the Boston Journ. of Nat. Hist., VII, 1862, in which all the N. England species, and a few others, are systematically arranged; and my Smithsonian Catalogue of described N. American Orthoptera, 8vo, 1868, an alphabetical index to the literature previous to 1867.

For other important systematic works on the classification of Orthoptera, see the faunal works of Fischer, Orthoptera Europaea, 4to, 1853 (Latin), and Fieber's European Orthoptera in Lotos III-IV (German).

For works on particular families, besides those specified above, see the following: *Forficulariae*,—Dohrn's Monographie der Dermapteren, in the Stettiner Entom. Zeitung, XXIV-XXVI (German, with Latin diagnoses), my Catalogue of the family, in the Proceedings Bost. Soc. Nat. Hist., XVIII, and my Synopsis of the N. American species in the Bulletin U. S. Geol. Surv. Terr., II. *Blattariae*,—Brunner, Système des Blattaires, 8vo, 1865 (French, with Latin diagnoses). *Mantides*,—an illustrated catalogue (4to) has long been in preparation by Westwood, and may be looked for at any time. *Phasmida*,—Westwood's Illustrated Catalogue of the Phasmidae of the British Museum, 4to, 1859 (Latin and English). *Acrydii*,—Thomas's Acrididae of N. America, 4to, 1873 (English).

The N. American species have been mostly described by Brunner, Burmeister, Charpentier, DeGeer, Dodge, Dohrn (H.), Drury, Fabricius, Fitch, Germar, Girard, Gray (G. R.), Haldeman, Harris, Hermann, Kirby, Linné, Olivier, Palisot, Saussure, Say, Scudder, Serville, Smith (S. I.), Stål, Stoll, Thomas, Thunberg, Uhler, Walker and Westwood. The necessary references to them will follow under the special groups. *Samuel H. Scudder.*